Wireless Command and Control

Reducing Industrial Vehicle Maintenance Costs

31 July 2013

CFAMS ‘Black Box’ adds vision & intelligence to your vehicles

Reduces:

- ✓ Impacts resulting in vehicle & facility damage
- ✓ Unauthorized access to vehicles
- ✓ Fleet size
- ✓ Labor hours and overtime
- ✓ Carbon footprint
- ✓ Insurance costs

Increases:

- ✓ Safety
- ✓ Security
- ✓ Visibility
- ✓ Accountability
- ✓ Productivity
- ✓ Reliability

Who's Benefiting:

Technology Architecture Overview

Real time 2-way wireless communications

FIPS compliant

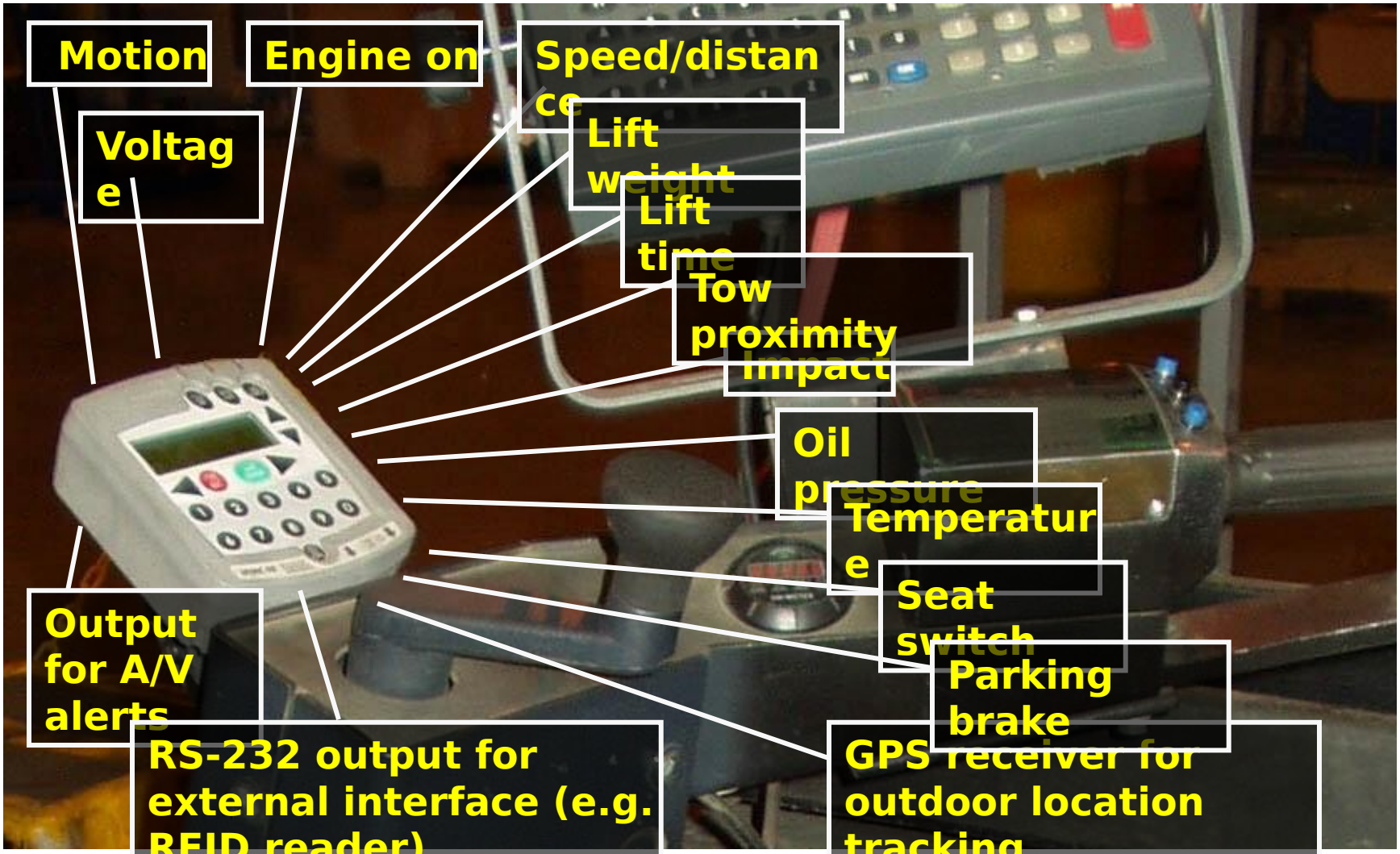
Software on server

PC workstations access software anywhere on LAN

Vehicle Asset Communicator

Intelligent controller on each vehicle reads CAC card to access vehicle

Available System Sensors



Industrial Truck Safety Overview

- OSHA regulates industrial trucks because they injure tens of thousands each year – about 100 fatally.
- Managing industrial truck safety without technology is problematic. Wireless technology for industrial truck safety is a best practice in many of the world's largest enterprises.

➢***Vehicle management technology is improving safety and simultaneously delivering a return on investment.***

Forklift Data from OSHA

Forklift accidents cause 40,000 injuries & deaths each year – 2nd leading cause of fatalities in private sector, after highway vehicles*

- Powered Industrial Truck safety violations are perennially among OSHA's top 10 problems.

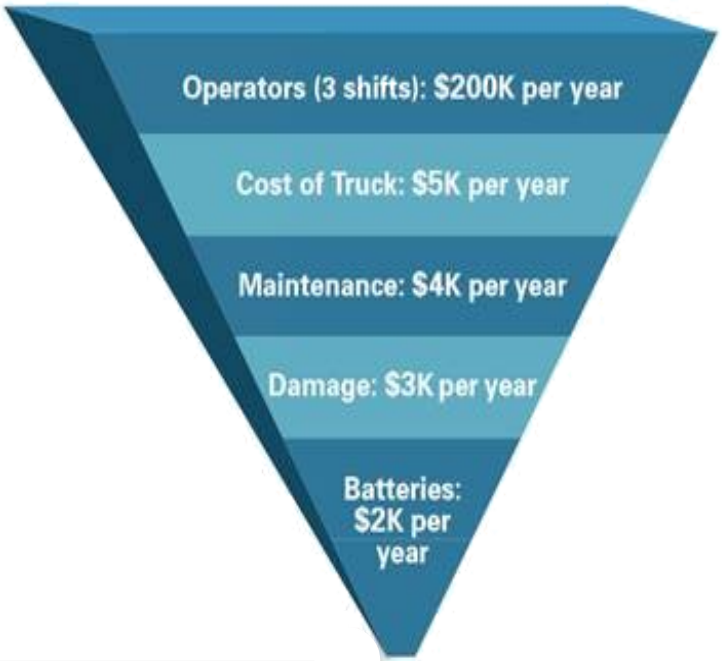
3,500 violations of
OSHA regulation 1910.178 last year

- It is a violation of Federal law for anyone to operate a forklift who is not properly trained and certified to do so.

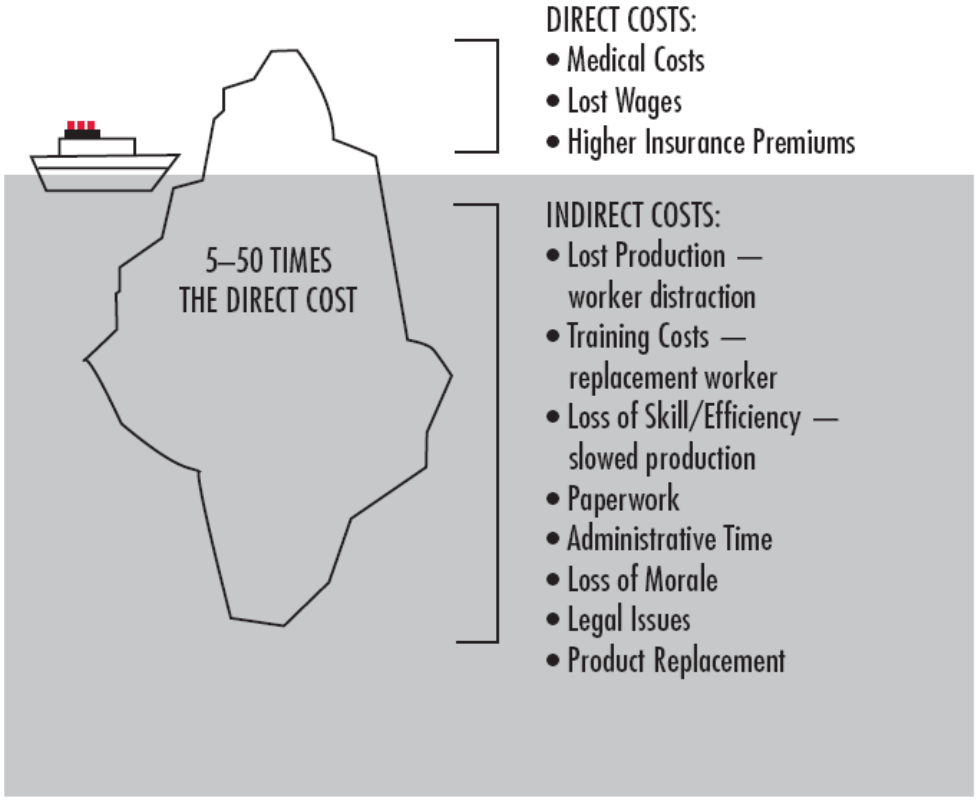
*Source: OSHA

Industrial Equipment Cost Overview

- **Typical hard costs per vehicle**


Operators (3 shifts): $200K per year
Cost of Truck: $5K per year
Maintenance: $4K per year
Damage: $3K per year
Batteries: $2K per year

- **Total hard and hidden costs of accidents**



Source: *The Workers Compensation Fund's* Workers Compensation Program, Safety Program & Cost Control Guidebook

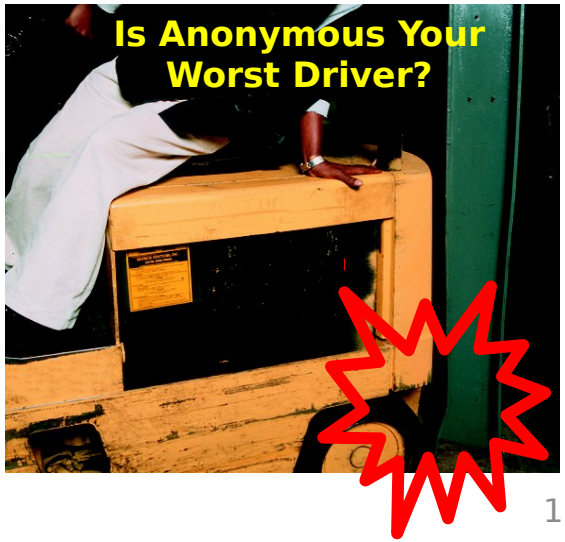
Tools for Reducing Maintenance Cos

- Establish accountability & reduce damage with access control & impact sensing
- Automate safety checklist compliance and reporting of vehicle maintenance issues
- Schedule PMs based on actual use
- Get real-time vehicle location visibility & remote lock-out capability:
  - Ensures PMs get done on schedule
  - Maximizes productivity & reduces labor costs for maintenance staff
  - Mechanics love it: "Saves a fortune in aggravation"*

*Quote from Fortune 50 automotive

Damage Reduction – Impact Management

- Industry leading Impact Sensing
  - Measures force and duration to distinguish between a tap and major event (reduces false alarms)
  - Technology auto-learns for each vehicle and environment
  - Historical investigation of events
- Trigger preferred safety response by impact severity
  - Data recorded
  - Special impact checklists to report damage
  - Alerts via email or page
  - Optional vehicle lock-out

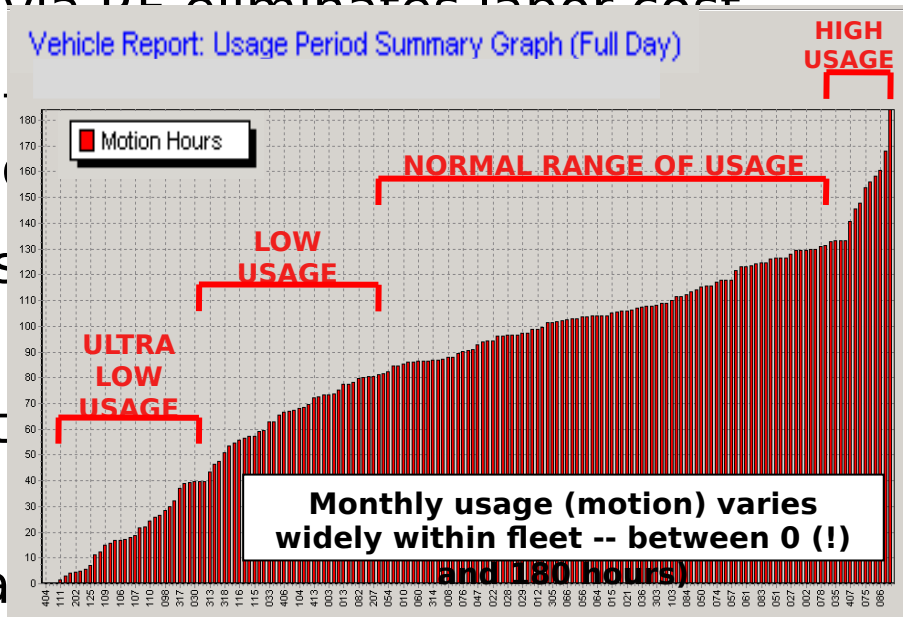


Vehicle Safety – Electronic Checklists

- Mandatory checklists maintain OSHA compliance
  - Configurable frequency required based on your work environment (e.g. 1x per shift/vehicle/day)
  - Operators must complete checklist in set time
- Reports vehicle safety issues automatically
- Responses have 3 user-defined severity levels: normal, warning, critical
- Critical responses can automatically trigger preferred safety procedures, including vehicle lockout for maintenance
- Automatic answer randomization prevents “finger-whipping”
- Checklists can be customized (e.g. by vehicle type)
- Multi-language checklists supported

Maintenance Efficiency – PM Planning Tools

- True motion tracking:
  - Reflects wear & tear more accurately than hour meters
  - Provides consistent metrics for ALL vehicles
  - Maximizes efficiency of PMs (based on actual run time vs. calendar time)
- Automatic vehicle data upload via RF eliminates labor cost
- Reports automatically emailed
  identify impending PMs require
- Automatic on-vehicle messages
  driver about PM due
- Optional sensors (oil, temp., lift
  battery, etc.)
- Optional automatic data interfa
  with existing CMMS (e.g. FEM)


Vehicle Report: Usage Period Summary Graph (Full Day)
HIGH USAGE
Motion Hours
NORMAL RANGE OF USAGE
LOW USAGE
ULTRA LOW USAGE
Monthly usage (motion) varies widely within fleet -- between 0 (!) and 180 hours)

Fuel/Emissions Savings – Idle Time Out

- After configurable period of inactivity, vehicles automatically shut off
  - Saves significant fuel cost for IC vehicles
  - Significantly reduces emissions

I.D. Systems, Inc

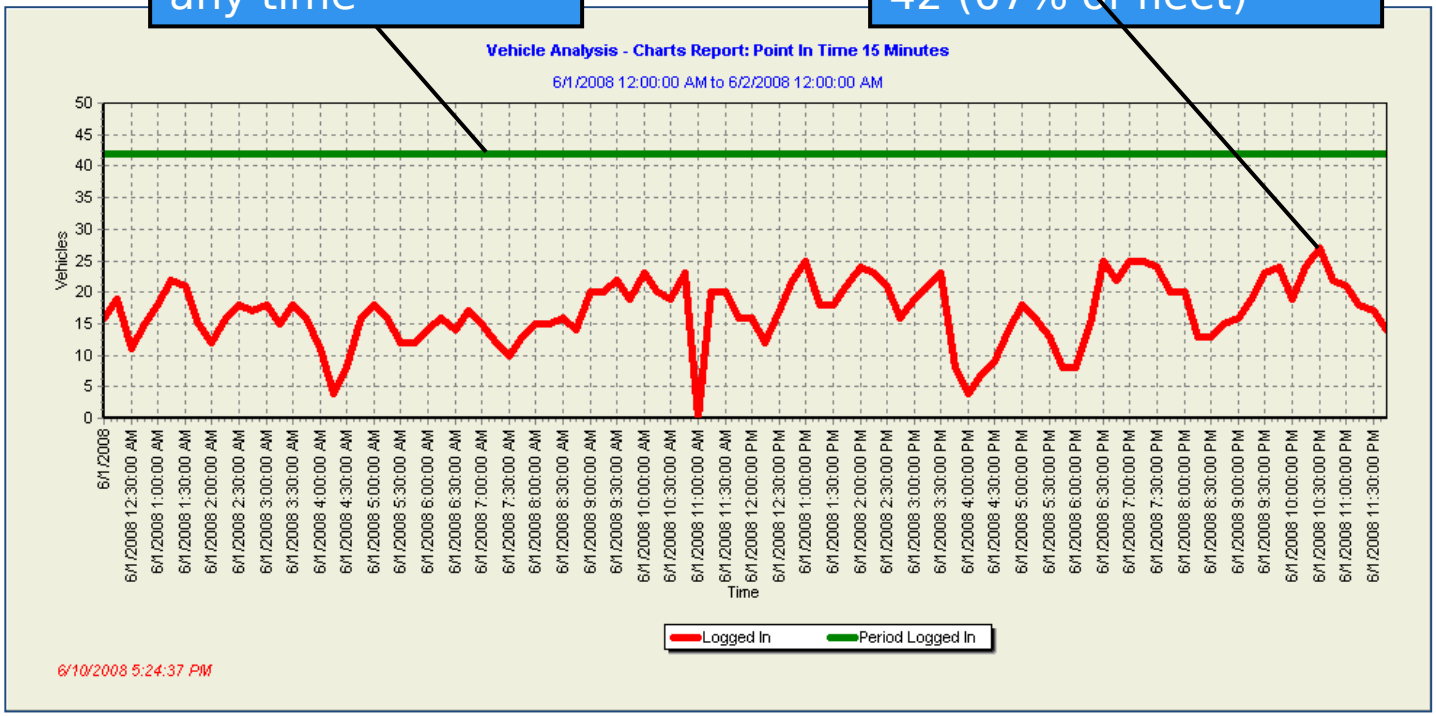
Vehicle Analysis Report: Usage Summary

Make	Vehicle	Login hrs	Motion hrs	Idling hrs	Engine Save hrs
TIGER	00747	1.879	0.944	0.268	0.901
	00757	2.916	1.807	0.696	0.062
	80709	2.361	1.237	0.199	0.577
				(Sum) 1.163	(Sum) 1.541
TUG INC	14024	2.247	1.094	0.173	3.145
	14672	0.043	0.015	0.016	0.000
	51664	2.874	1.104	1.099	0.693
	51871	0.668	0.426	0.116	0.000
	53970	2.608	0.741	1.261	0.353
	59366	2.102	1.475	0.000	0.245
	59600	0.639	0.359	0.117	0.159
	80279	2.090	1.386	0.378	0.308
	P58800	1.715	1.154	0.125	0.091
	P59251	1.069	0.621	0.063	0.041
	P59252	2.290	1.396	0.260	0.523
	P59253	3.755	2.174	0.642	1.111
	P59254	3.698	2.473	0.982	0.194
	P59255	1.267	0.510	0.324	0.677
	P59257	1.842	1.237	0.135	0.429
	P59259	0.579	0.233	0.049	0.331
				(Sum) 10.708	(Sum) 12.103
				(Grand Sum) 11.871	(Grand Sum) 13.644

Fleet Optimization – Peak Fleet Utilization Analysis

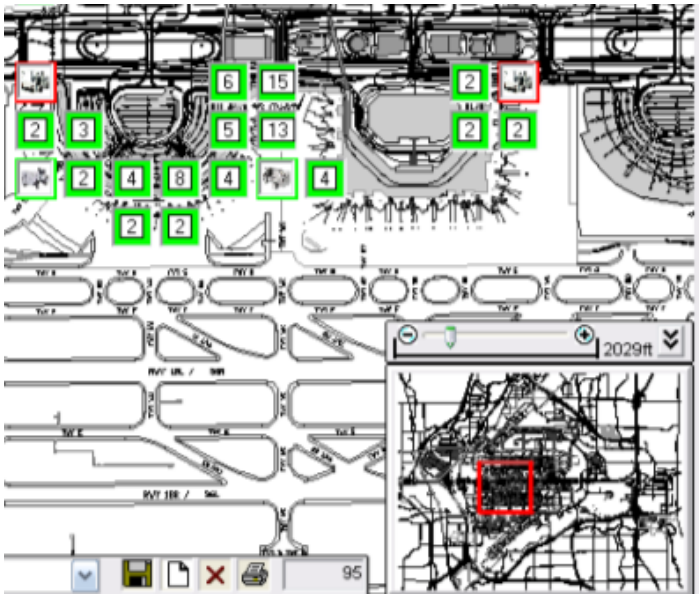
Green line: Total number of vehicles used during the day at any time

Red line: Number of vehicles in simultaneous use. Max. is only 28 out of 42 (67% of fleet)



Fleet Optimization – Real-Time Fleet Visibility

- GPS on every vehicle for real-time visibility
- Graphical display of vehicles/operators with flexible views, zooming & status indicators
- Indoor location tracking also available
- Speed management
- Geo-fencing for security
- Historical playback of vehicle locations to analyze travel paths (for route optimization, quality control, IE standards validation)
- Embedded Text Dispatching; just click vehicle icon to target messages



Red River Army Depot (RRAD) Project Scope

- 50 Vehicle Asset Communicators (VACs) being installed for pilot phase (goal to expand to full fleet of 250 vehicles)
  - CAC ID card access control
  - FIPS 140-2 secure Wi-Fi
  - GPS location tracking & speed management
  - Impact management
  - Lift time sensor
  - Engine temperature sensor
  - Oil pressure sensor
  - Load sensor on select vehicles
  - Audible alarms
- Other system elements
  - Dedicated application/database server
  - Windows-based client-server software with SQL database engine
  - Wireless Asset Manager for automated, wireless VAC configuration
  - Plan to automate maintenance data feed from CFAMS to

RRAD Savings Projections (full 250-vehicle fleet)

- Accident Reduction Savings - $100,000/year
  - Currently, there is little or no accountability for vehicle use and accidents; anonymous damage costs are high (typical of all industrial environments)
  - CFAMS CAC-card access control ensures only trained, authorized operators can use equipment & establishes total operator accountability
  - CFAMS impact management system identifies aggressive driving & provides various automatic responses to multiple incidents by operators
- Safety Inspection Savings - $20,000/year
  - Currently, supervisors spend at least 6 hours/week performing spot checks on vehicles & interviewing operators
  - CFAMs requires operators to perform these checks before operating the vehicle; all data is captured & reported electronically—no paper

More RRAD Cost Savings…

- Maintenance Savings - $100,000/year
  - PMs now scheduled by calendar every 1-6 months at approx. $250 per PM
  - CFAMS reduces PMs & costs by basing schedule on actual usage hours
  - Lack of awareness of emerging problems now leads to expensive repairs
  - CFAMS automatically flags problems identified on OSHA checklists & monitors key vehicle health indicators (oil pressure, temperature, etc.)
- Reduced Fleet Size - $100,000+/year
  - RRAD spends approx. $900,000/year to procure industrial vehicles
  - CFAMS demonstrated potential to reduce fleet size 27% in SIAD pilot; conservative estimate at RRAD is 14% (equivalent to 35 vehicles)
  - Savings derived by purchase avoidance (12% of procurement costs) & outright elimination of redundant vehicles

More RRAD Financial Benefits…

- Trip Tickets Eliminated - $200,000/year
  - CFAMs will automatically feed vehicle data to existing EFEMS system
  - Frees up 60% of 1 employee's time (currently spent entering this data)
  - Adds 20 minutes of productivity per week for every operator & supervisor

- Productivity Improvements - $675,000/year
  - Improved maintenance controls = less vehicle down time
  - Vehicle usage data & breadcrumb trails identify work inefficiencies
  - Visibility of vehicle location/status enables more efficient dispatching
  - Fleet right-sizing results in reduced congestion in production areas

- Improved Labor Cost Management - $635,000/year
  - Smaller fleet = opportunity to reduce/reallocate labor
  - 35 fewer vehicles should equate to at least 10 operators reallocated

Other Significant Benefits (Not Yet Quantified)…

- Maintenance costs associated with vehicles identified by CFAMS as being redundant (to be eliminated or mothballed)
- Reduced overtime costs due to more efficient work in normal hours
- Fuel cost savings through automatic idle time-out
- Training efficiency through automatic reporting of operators whose certification is about to expire

$$$ RRAD Bottom Line $$$

	Pilot	Full Implementation
Net Present Value (NPV) of Benefits	$3,015,795	$13,948,819
Benefit to Investment Ratio (BIR)	13.269	11.489
Payback Period (Years)	0.710 yrs	1.612 yrs

Note: Investment for additional vehicles is assumed to occur in second year.

Sierra Army Depot (SIAD) Pilot Benefits

- Pilot data indicate recurring cost savings of up to $7,000/vehicle/year
- System also significantly improved safety (observed reduction of lost work-time accidents and facility damage)
- Breakout of annual cost savings opportunities demonstrated in 50-vehicle pilot program:

Preventative Maintenance/Repair	$17,700
Fleet Reduction: Vehicle Lease savings	$63,000-$90,000
Added maintenance savings	$7,350-$10,500
	$14,350-$20,500
Fuel/Energy Savings	$131,040-
Labor Savings	$187,200
Damage Reduction	$12,500
Total Annual Savings Opportunities	**$245,940-$338,400**

SIAD Benefits Extrapolated

- Breakout of annual cost savings opportunities applied to entire 184-vehicle MHE fleet at SIAD:

Preventative Maintenance/Repair	$65,140
Fleet Reduction: Vehicle lease savings	$231,840-$331,200
Additional Maintenance/Repair	$27,050-$38,640
Fuel/Energy Savings	$52,800-$75,440
Labor Cost Reduction	$482,230-$688,900
Damage Reduction	$46,000
Total Annual Savings Opportunity	**$905,060-$1,245,320**

- Internal Rate of Return: 137% to 227%
- 5-Year Net Present Value: $3.1 million to $4.7 million
- Payback (cash flow positive): 10 to 14 months

Comments from System Users at SIAD

- “Accountability is huge…people now know if something happens…” operators “have to be more diligent in their day-to-day job”
- The system “tracks down every piece of MHE every day”
- “Our accident rates dropped…employees are buying into the safety culture”
- “When columns are bumped, the forklift doesn’t move, and the operator and equipment number are recorded”
- Electronic checklists “give a mechanic the opportunity to troubleshoot, find the issue, and fix it before it becomes a major problem”
- “With this system we do our maintenance based on actual usage time…not a routine monthly schedule”
- Shipping & receiving had “a huge spike in equipment utilization” which justifies “reducing the fleet” for “more cost savings to the depot and to our customers”
- “This is a good system” with “durability”—“we’ve had no malfunctions”
- “We’re very supportive and have 100% regard for recommending this system”

- The annual cost associated with industrial vehicle operations is well beyond the acquisition, labor, maintenance, energy, damage repair, and lost work time cost from accidents. In today's Lean Logistics environment, failure to maximize productivity in material handling and remanufacturing operations accounts for a substantial "tax" on operational expense due to inherent process inefficiencies.
- CFAMS is a cutting edge industrial fleet vehicle management solution, utilizing the latest in real-time sensory data collection, and operator interface technology while improving operational safety at the vehicle level, providing actionable management reports on operational (direct mission support) utilization and CBM status.

CTMA Investment - $660K; In

Realized Savings to Date: $1.2M

Centralized Fleet Automated Management System (CFAMS) A vehicle management system with potential savings to DoD of over **$490 million** annually

Application by Armed Services:

Army (CTMA-sponsored):

- Pilot sites: Red River & Sierra Depots
- Observers: Anniston & Tobyhanna Depots, TACOM, Army Materiel Command

- **Additional Strong Poten**
  - Air Force
  - Marines
  - Navy
  - DLA

DoD Benefits

Level 1 Benefits:

SIAD: Proven safety tool to ensure accountability for vehicle use, perform mandatory pre-operational safety checks, and report on vehicle impacts. In addition, demonstrated pilot-scale savings, extrapolated depot-wide, results in annual cost savings of more than $1.2 million.

Level 2 Benefits:

AMC: Implementation at all Army facilities would result in anticipated savings of approx. $123 million annually.

Level 3 Potential:

Anticipated savings for all services (non-tactical vehicles) is estimates at more than $490 million

Summary

- Improve industrial vehicle **operator management & accountability**
- Reduce operating costs with **maintenance control, damage reduction & fuel savings**
- Reduce capital costs through **reduction/right sizing**
- **Enhance safety** in workplace
- **Increase utilization/productivit** by analyzing with pre metrics & real-tir
- **CFAMS is comprehensive soluti** (hardware, software, trainir reporting, ongoing support)